

# **Mike Splinter**

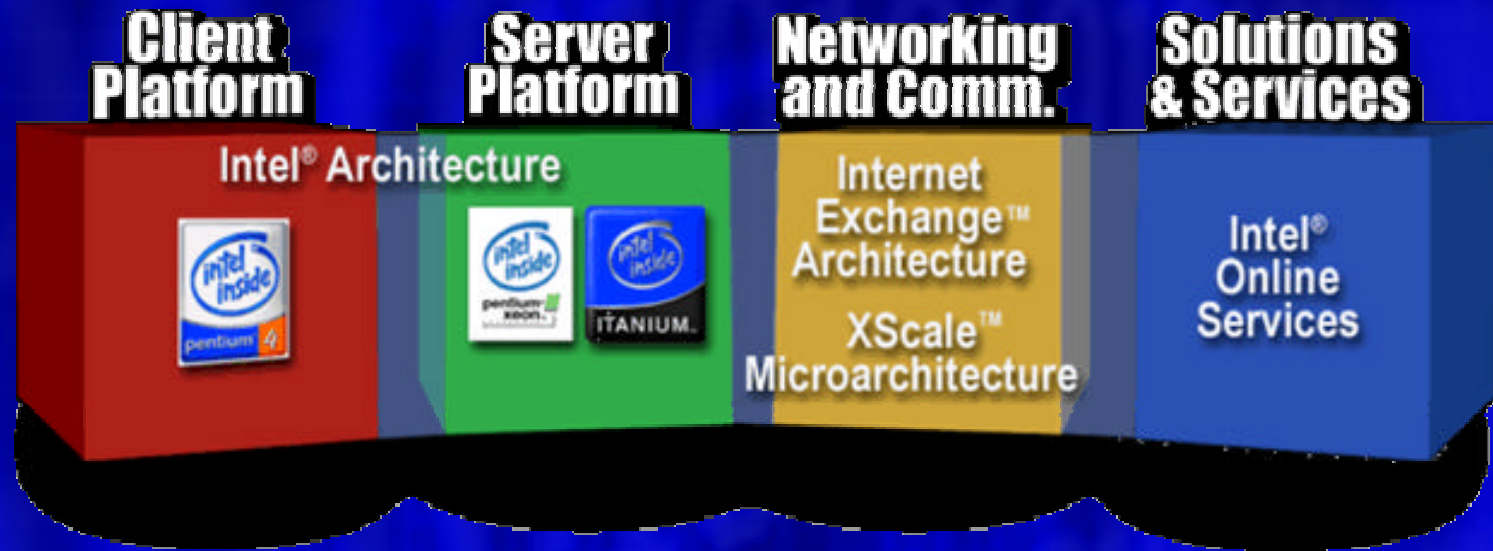
Executive Vice President,  
General Manager,  
Technology and  
Manufacturing Group

# Agenda

- Overview
- Logic Technology & Manufacturing
- Flash Technology & Manufacturing
- 300mm Conversion

# Intel Strategy:

Building block supplier to the Internet Economy



**Silicon and Solutions for the Internet**

# Investing in the Future Research & Development



# Investing for Growth Expanding Capacity

\$B

6

*Capital Expenditures*

3

0

'90

'91

'92

'93

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'98

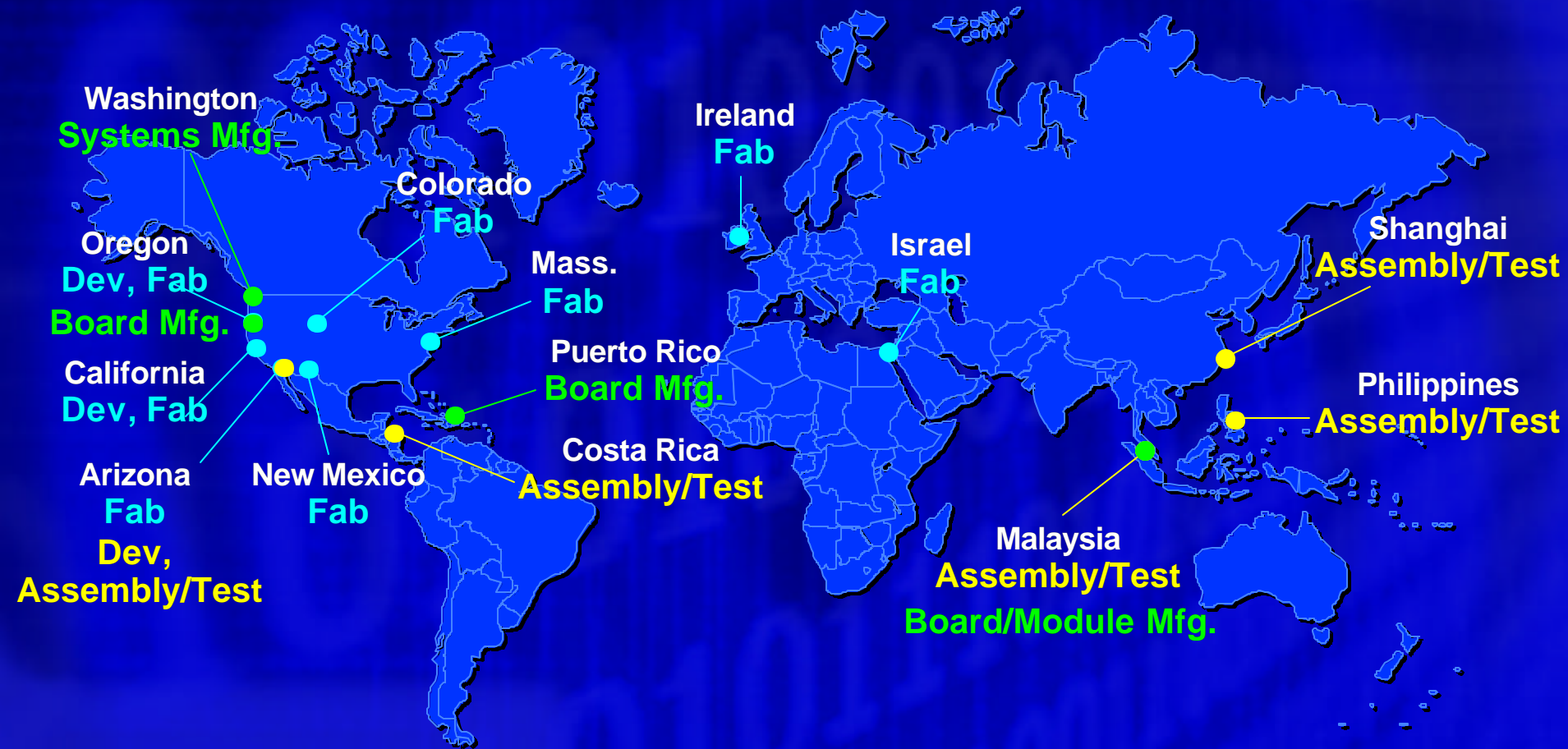
'99

'00

Estimate



# Intel's Manufacturing Sites



# Agenda

- Overview
- **Logic Technology & Manufacturing**
- Flash Technology & Manufacturing
- 300mm Conversion

# Logic Process Evolution

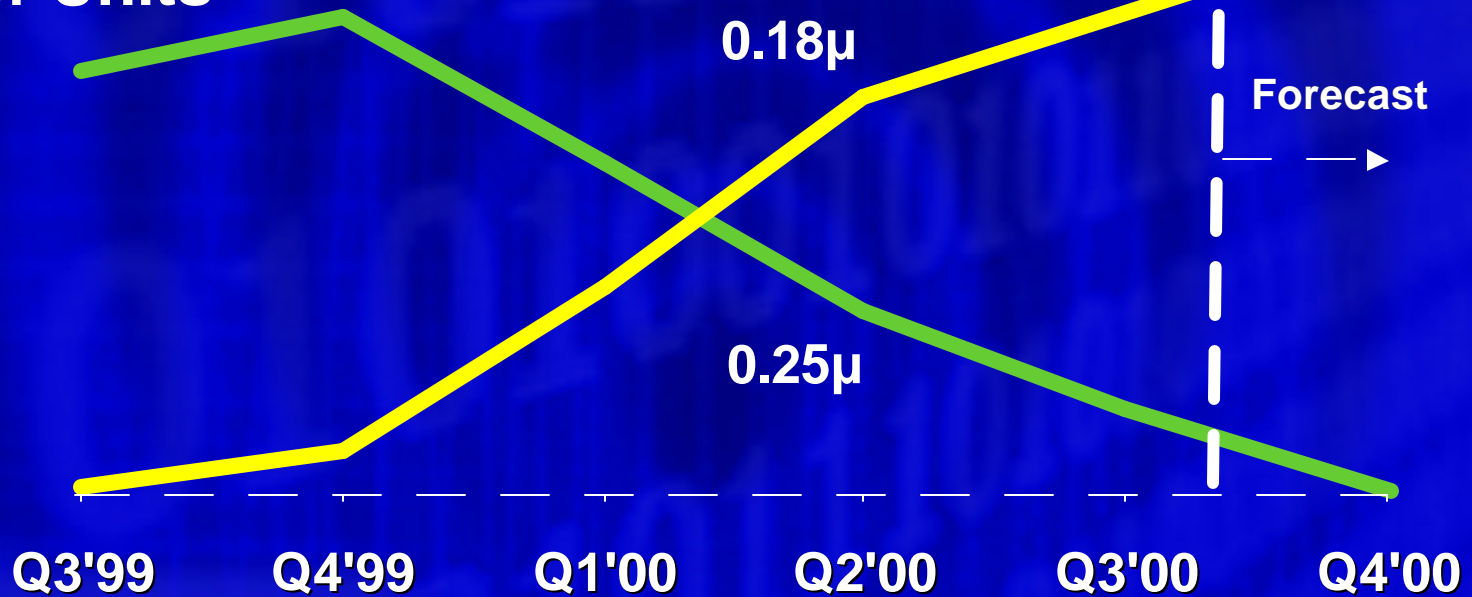
	<u>P648</u>	<u>P650</u>	<u>P852</u>	<u>P854</u>	<u>P856</u>	<u>P858</u>	<u>P860</u>
<b>Production</b>	<b>1989</b>	<b>1991</b>	<b>1993</b>	<b>1995</b>	<b>1997</b>	<b>1999</b>	<b>2001</b>
<b>Generation</b>	1.00	0.80	0.50	0.35	0.25	0.18	<b>0.13 mm</b>
<b>Gate Length</b>	1.00	0.80	0.50	0.35	0.20	0.13	<b>0.07 mm</b>
<b>SRAM Cell</b>	220	111	44	21	10.6	5.6	<b>2.09 mm<sup>2</sup></b>
<b>Power Supply</b>	5.0	5.0	3.3	2.5	1.8	1.5	<b>1.3 volts</b>
<b># Metal</b>	2	3	4	4	5	6	<b>6 (Copper)</b>

**New generation every 2 years –  
Technology & Manufacturing Leadership**



# CPU Technology Conversion

Shipments  
in Millions  
of Units

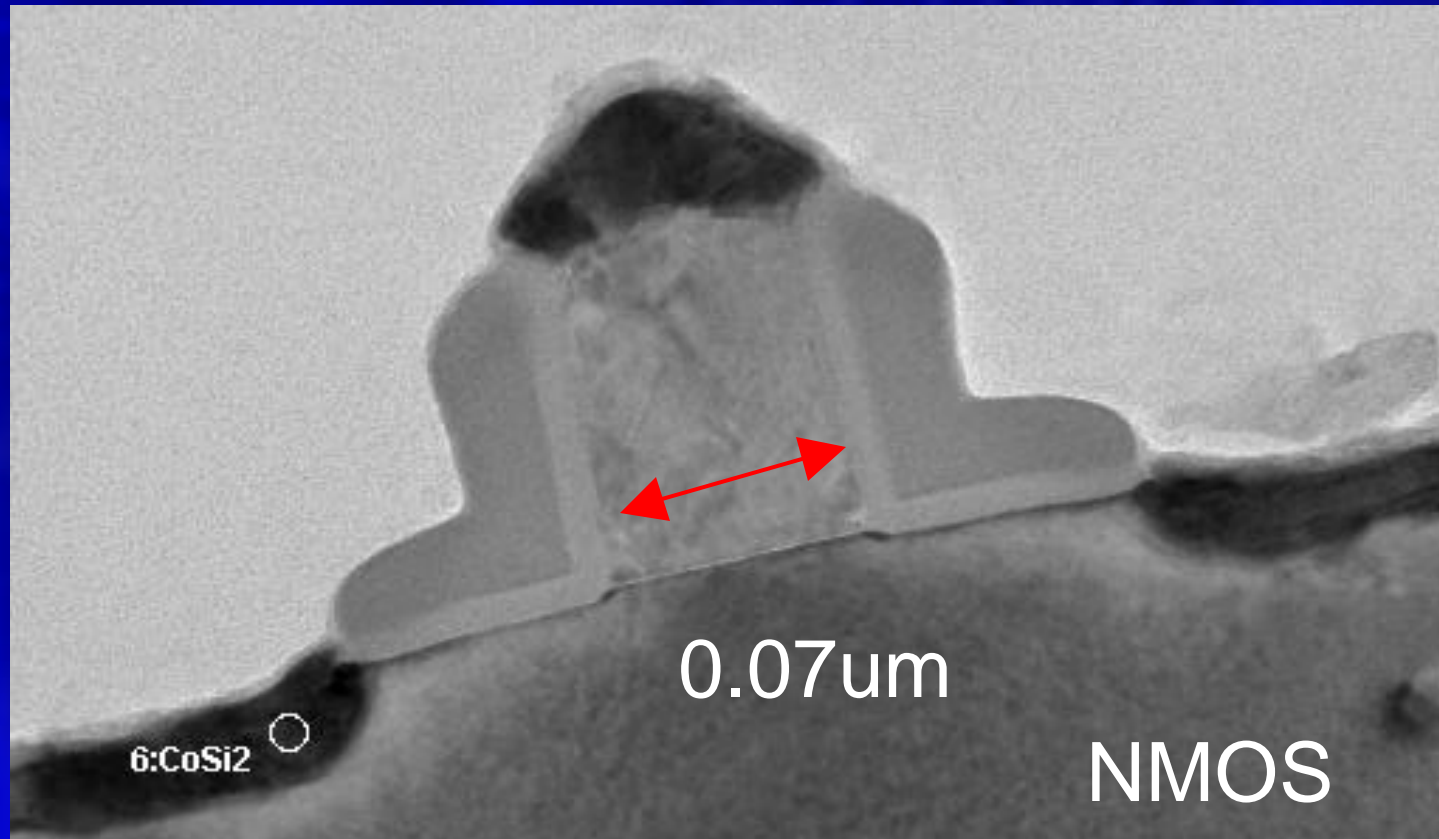


# Intel Pentium® 4 Processor

- Five high volume 0.18µm factories available for Pentium 4 processor ramp
- Pentium 4 processor in all performance & mainstream market segments by end of 2001
- Transition to 0.13µm starts in Q4 01

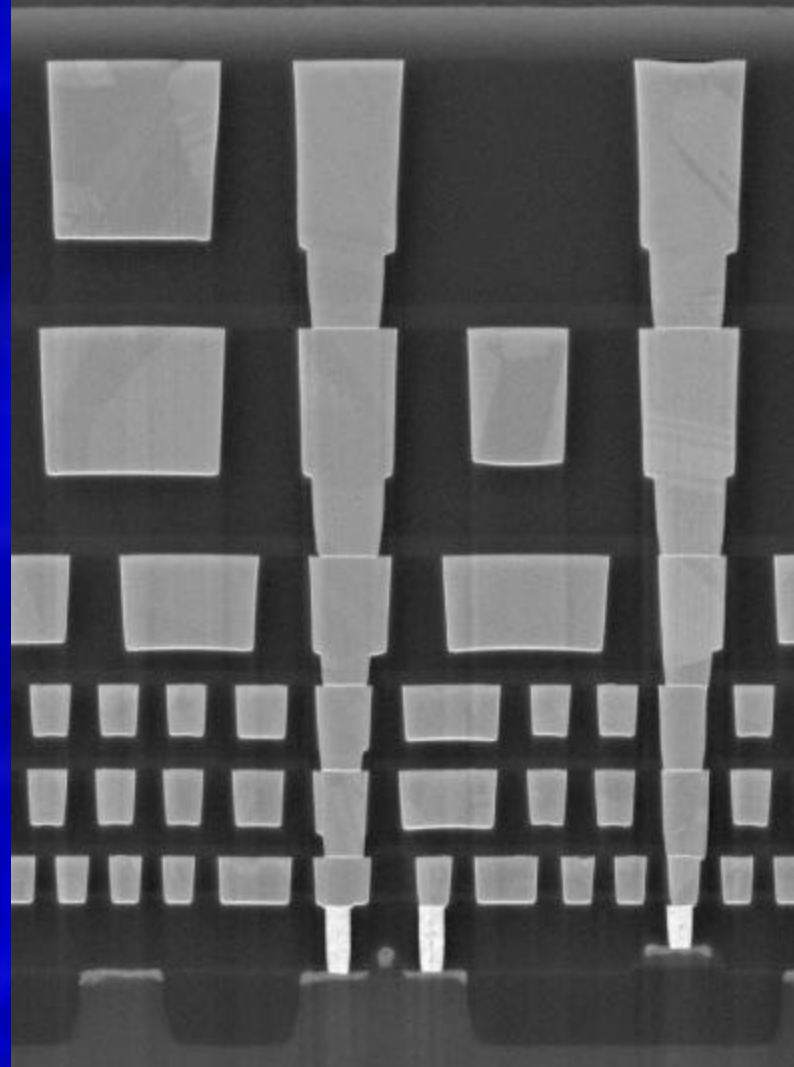
# 0.13 $\mu$ m Technology Features

- **Industry leading performance and reduced power**
  - World's smallest/fastest production transistors - foundation of fast microprocessors
  - Six layers of copper interconnects with low-K dielectric - interconnect density and performance
  - Technology operates at 1.3 volts or less
- **High density memory cell drives cost & performance**
  - SRAM cell size of 2.45 $\mu$ m<sup>2</sup> - smaller die & larger caches
- **First Pentium® III silicon complete**



0.07 um  $L_{\text{GATE}}$  Transistors





Metal 6

Metal 5

Metal 4

Metal 3

Metal 2

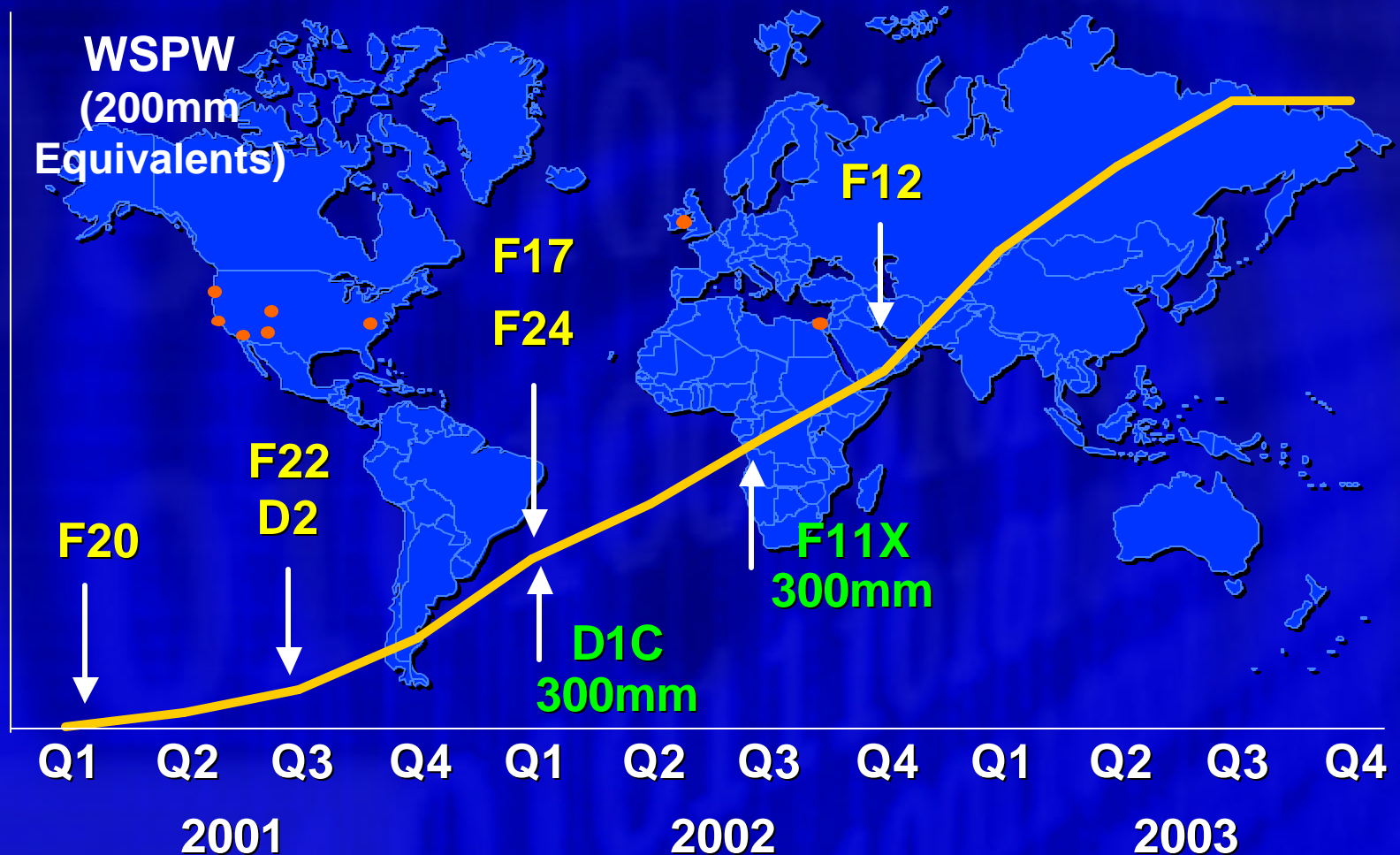
Metal 1

Transistors

6 Layers of Damascene Copper



# 0.13 $\mu$ m Process Ramp in 8 Factories



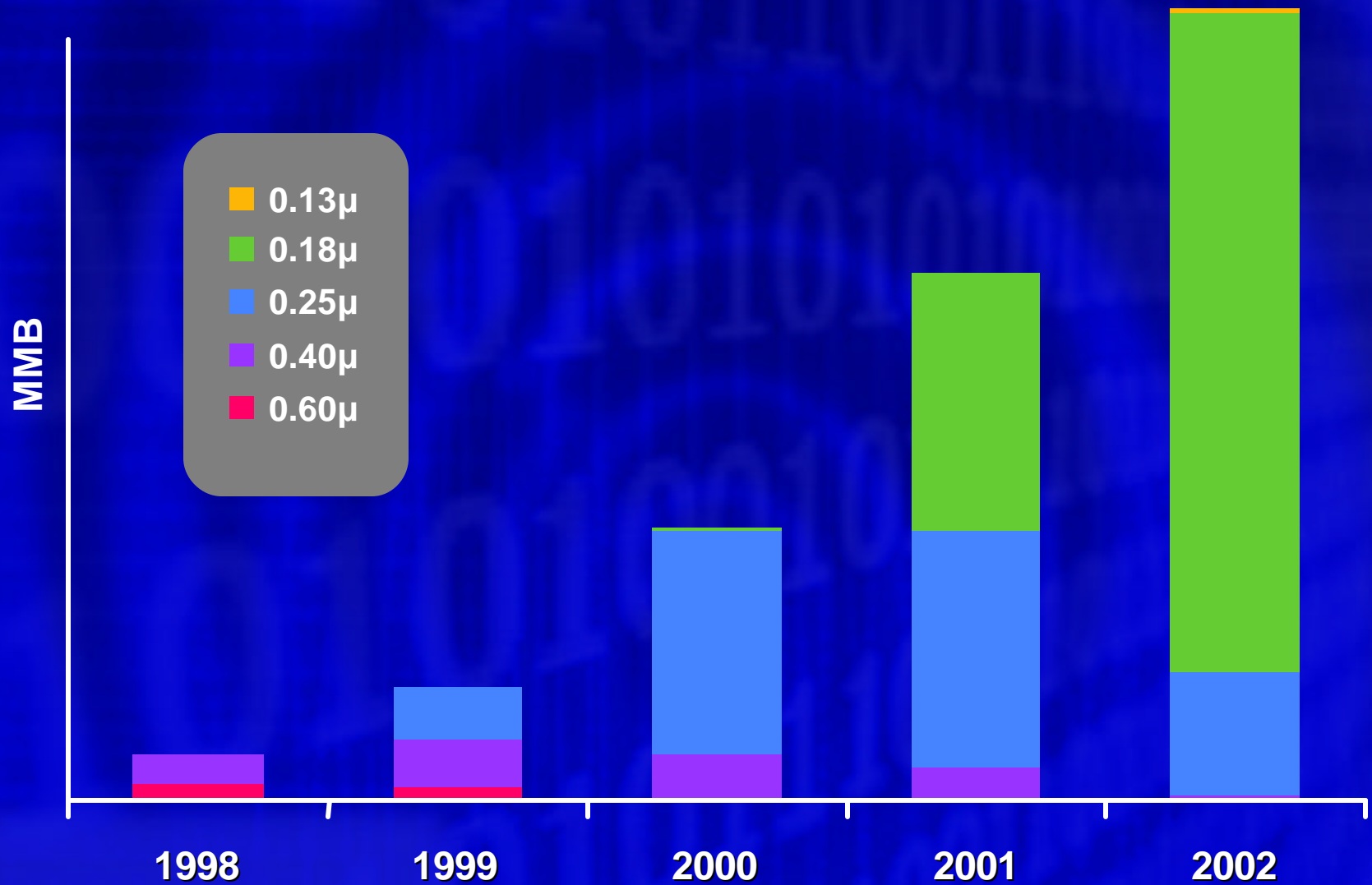
# Agenda

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- **Flash Technology & Manufacturing**
- 300mm Conversion

# Leading Edge Flash Technology

- **Smallest Flash cell size in industry –  $0.32\mu^2$** 
  - First with  $0.18\mu\text{m}$  flash production
  - Ramping 4 factories over next year
- **Pioneered StrataFlash™ technology for cost & density leadership**
  - 2 bit/cell in production for 2 years
  - Extend leadership with 4 bits/cell
- **Integrating leading edge logic & flash technologies to provide innovative 3G cellular products**

# Flash Technology Conversion



# Agenda

- Overview
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- Flash Technology & Manufacturing
- **300mm Conversion**



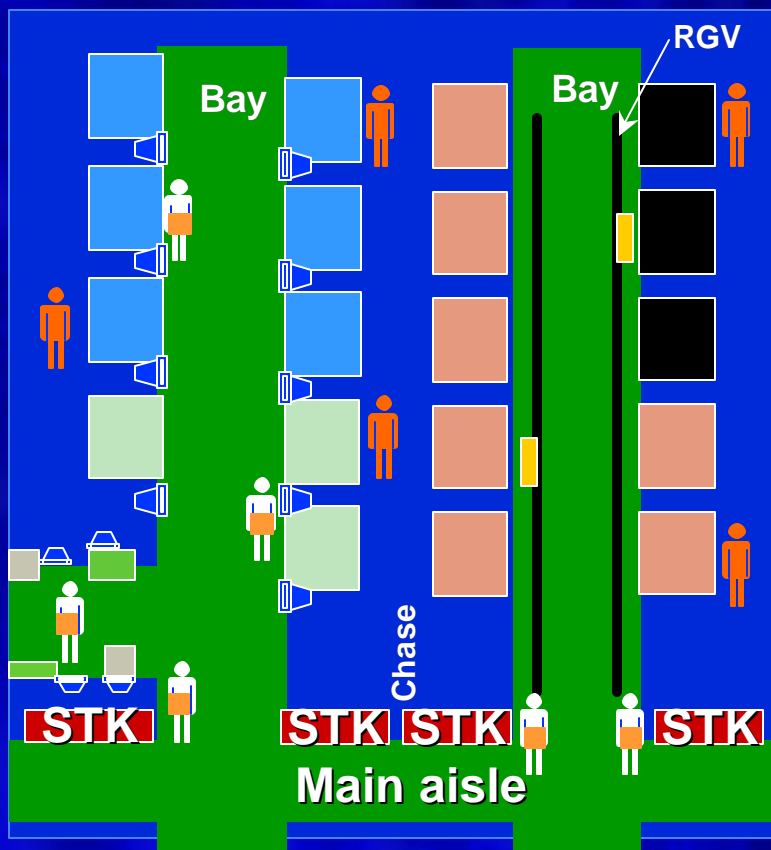
# 300mm Production in 2002

- **Two factories in progress**
  - Oregon, New Mexico
  - Development line in start up
- **Volume and Economics Compelling**
  - 240% more die/wafer than 200mm
  - Expect 30% cost reduction
  - 40% less energy/water consumption per die
  - 50% less labor content per die



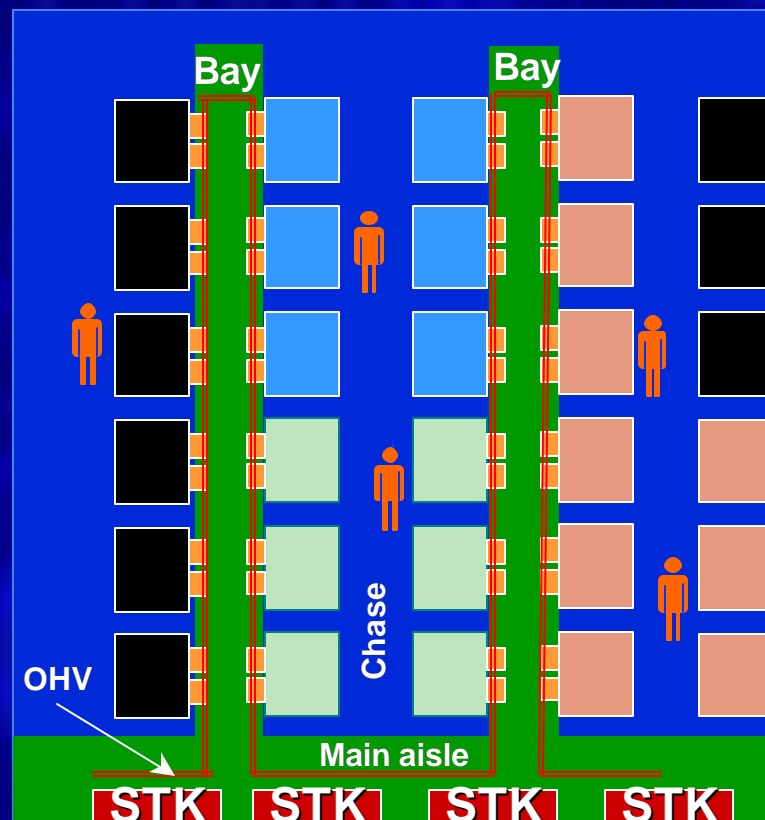
# HVM Layout Differences

200mm



- Manual wip movement and RGV
- Wider bays for MT's.
- WIP racks, workstations in bays

300mm



- 100% OHV automated material handling
- Narrow bays; MT's in the chase.
- Command centers for WIP movement.

# 300mm Revolutionizing Factory

- Fully automated material handling system
- Integrated material scheduling & movement
- Fully web enabled decision support systems
- Remote diagnostic capability

# Summary

- **Leading edge Technology**
  - Fastest transistors in the industry
  - Copper and low-k interconnects
  - Voltage scaling for low power
  - Dense SRAM cell
  - Transistor scaling vision for the next decade
- **Leading edge manufacturing**
  - Industry's fastest high volume ramps
  - Accelerated 0.18 $\mu$ m conversion for logic & Flash
  - Beginning 0.13 $\mu$ m production ramp early 2001
  - Functioning 0.13 $\mu$ m microprocessors
  - Leading the way on 300mm logic technology

For more information visit Silicon Showcase at  
[www.intel.com/research/silicon](http://www.intel.com/research/silicon)